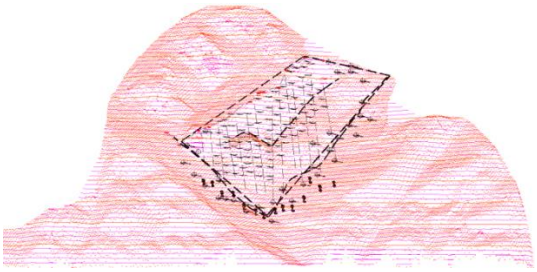
North Carolina Department of Transportation
Transportation Program Management Unit - Value Management
Innovative Technologies and Products Awareness Report
February 6, 2019

PRODUCT HIGHLIGHT – LiDAR for Slope Modeling

Light Detection and Ranging (LiDAR) is a surveying method that uses pulsed laser light to measure distances. The data obtained from the measurements is combined with aerial photography by the Department's Photogrammetry and Location and Surveys Units to develop 3-D terrain models. The Geotechnical Engineering Unit has begun using this technology in the western part of the state for monitoring areas for rock falls and landslides. This process, called slope modeling, is performed using a truck-based LiDAR system to scan identified high-risk areas on a quarterly basis. These models are compared to site photos to remove distortion caused from heavy vegetation and then used to evaluate slope movement over time. By monitoring these movements, slopes that show signs of rock falls or land shifts can be reinforced using anchor bolts driven into specified locations of a slope or rock can be removed to prevent landslides. This method was first used in late 2008 at the Pigeon River Gorge along I-40 – an area with a history of rock slides. Over 100 bolts were installed on the face of the slope to reinforce the area.



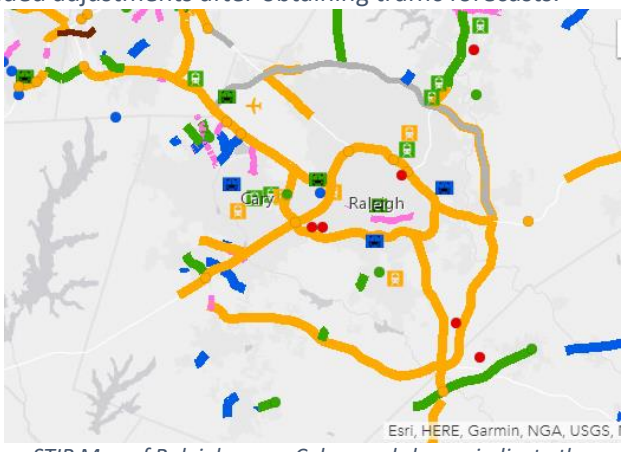
3-D slope model of Pigeon River Gorge showing anchor locations for reinforcement

Slopes that are determined to need reinforcement require evaluation for anchoring locations. With slope reinforcement planning, a task that used to take several weeks of surveying, mapping, and measuring involving crews on ropes along a slope was done in several hours using the slope modeling on I-40. Typically, crews would use ropes to navigate the slope for measurements and locating points for reinforcement. With a mobile LiDAR scanner located on a vehicle, the slope can be accurately modeled from the road or base of the slope for review. The Geotechnical Engineering Unit is able to use the 3-D models generated by the scans and pinpoint anchor installation locations. The Geotechnical Engineering Unit along with the Aviation Unit has also began evaluating the use of drones for LiDAR scanning, which would allow for large scale terrain mapping and avoid personnel located in a potentially dangerous location.

PRODUCT INNOVATION – Proactive Traffic Forecasting

Traffic forecasting plays a large role in project development. The estimation of future growth helps determine infrastructure planning in many aspects of transportation such as roadway capacity, interchange design, utility locations, environmental impacts, and signal requirements. The forecasting process involves collecting field data, speaking with those knowledgeable about local development, utilizing tools and data sources, and projecting travel trends 25+ years into the future. In the past, traffic forecasting was initiated when a project manager, design engineer, or local planning organization would make a request to the Transportation Planning Division (TPD). Usually, this would take place during a project's environmental planning phase. Providing forecasts to the design teams at this phase could cause delays in project delivery if initial designs needed adjustments after obtaining traffic forecasts.

Starting in 2017, the TPD implemented a new proactive model for the development of project level traffic forecasts. Using the State Transportation Improvement Program, the TPD is able to identify project delivery dates and develop a list of potential projects in need of a forecast before they enter the planning phase. They can then gather the needed data and information for those projects prior to receiving a formal request and provide the project delivery team the useful traffic forecasts earlier in the project planning process. As a result, design units are given important traffic data earlier to make project determinations such as purpose and need, selection of the preferred alternatives, and design. This process is helping avoid project design delays and enabling the Department improve the project delivery process.



STIP Map of Raleigh area. Colors and shapes indicate the type of project